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Resolution-based outlier factor and outlier mining algorithm for engineering applications

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With increasing automation and computerization of engineering domain applications, outlier mining has become increasingly important in detecting abnormal behaviors in engineering systems, observations on malpractice and poor management skills. A resolution-based outlier (RB-outlier) notion and RB-outlier mining algorithm is introduced to provide better solutions to outlier detection in engineering applications which differ substantially from the other domain areas. The RB-outlier notion is defined based on the concept of resolution change, i.e. change the scale of the data plots progressively from a high-resolution close view where no point has neighbors to a small-resolution distant view where all the points are condensed in one cluster. The features of each data point in terms of its neighborhood are captured and accumulated during this process to measure its degree of outlyingness. The RB-outlier mining algorithm generates outlier results by taking both local and global features of a dataset into account without requiring input of domain specific parameters which are usually unknown a priori. The RB-outliers can be used conveniently to rank and label top-n outliers for further investigation. Experimental tests on some engineering applications, including construction equipment fleet management, construction site operations, demonstrated its effectiveness and efficiency and on the other hand, the flexibility and robustness of the proposed algorithm allows it to be easily built into any real time monitoring system or decision support system for efficient outlier detection "on the fly".

Biography

Hongqin Fan has completed his PhD from the University of Alberta, Canada in 2007. His areas of expertise are in Data Mining, Construction Equipment Management, and Construction Information Technology. He is currently an Associate Professor in the Department of Building and Real Estate at the Hong Kong Polytechnic University, Hong Kong. He has published more than 30 papers in the field of Data Mining, Computer Applications and decision support in Construction Engineering and Management.

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